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C-A OPERATIONS PROCEDURES MANUAL

1.5.5 Check List for Approval of Electrical Substations at C-AD

Text Pages 2 through 3

Hand Processed Changes

<u>HPC No.</u>	<u>Date</u>	<u>Page Nos.</u>	<u>Initials</u>
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Approved: _____ *Signature on File* _____
 Collider-Accelerator Department Chairman Date

J. Sandberg

1. Procedure

This procedure provides instructions to C-A Power Distribution Group personnel for approval of electrical substations 208 volts and above.

2. Responsibility

- 2.1 The Head of the C-AD Power Distribution Group or his designee shall inspect all new electrical substations rated 208 volts and above before initial energization of said substation at C-AD. The findings of this inspection shall be documented and sent to the C-AD Chief Electrical Engineer.
- 2.2 The Head of the C-AD Power Distribution Group shall verify that the substation is installed according to nationally recognized codes and the meets all requirements of the C-AD.
- 2.3 The inspection process shall include completing the check list included in this procedure and submitting it to the C-AD Chief Electrical Engineer.
- 2.4 Other large transformer procurements such as for power supplies or experimental equipment shall be subject to the same inspection as determined by the C-AD Chief Electrical Engineer. This determination shall be made before installation of subject equipment.

3. Prerequisites

None

4. Precautions

- 4.1 The existing C-AD power distribution system (Delta Secondary) for experimental and high power equipment is either ungrounded or grounded through a high resistance. All new installations at C-AD shall be grounded through a high resistance. All existing floating systems will be grounded through a high resistance by August of 2007.
- 4.2 Incorrect breaker settings can lead to unnecessarily high arc flash exposures. It is extremely important that correct breaker coordination be done on all substations.
- 4.3 Correct arc flash calculations and other protective devices settings depend on using correct as-built documentation.

5. Requirements

- 5.1 No new substation at C-AD shall be put into operations until its one line drawings have been fully updated, as installed, and have been submitted to the electrical drafting group for final revision.
- 5.2 No new substation at C-AD shall be put into operations until the Head of the Power Distribution Group has reviewed and approved its breaker coordination documentation. Key coordination parameters shall be linked to the one line diagrams as part of system configuration control.
- 5.3 No new substation at C-AD shall be put into operations without an appropriate arc flash calculation.
- 5.4 All new substations at C-AD shall either be solidly grounded or high resistance grounded. Floating systems shall not be allowed unless approved by the Chief Electrical engineer after a thorough design and safety review.
- 5.5 All high resistance grounded systems at C-AD shall have local ground fault indication. It is preferable that all such systems have remote ground fault indication. Remote monitoring of ground faults may be waved by the C-AD Chief Electrical engineer after a thorough design and safety review.
- 5.6 Every effort shall be made in the design of new substations to mitigate the effects of arc flash faults. All new substations at C-AD shall undergo an analysis centered on reducing incident energy.

6 Documentation

- 6.1 Completed check list 8.1 below
- 6.2 System, as installed, one line diagrams.
- 6.3 A memo from the head of the C-AD Power Distribution Group to the Chief Electrical Engineer approving operation of the substation in question.
- 6.4 Documented arc flash analysis.
- 6.5 Documented breaker coordination calculations
- 6.6 Documentation of the review allowing a floating system, if appropriate.
- 6.5 Documentation allowing the system to operate with local ground fault monitoring only.

7 References

- 7.1 NEC 250.36 High Impedance Grounded Neutral Systems

8. Attachments

- 8.1 Substation Review and Approval Record

Attachment 8.1

Substation Review and Approval Record

Substation Description:

- | | | |
|------|--|-------------------------|
| 6.1 | Have arc flash calculations been done for the substation | _____ |
| 6.2 | Have breaker coordination calculations been done and reviewed | _____ |
| 6.3 | Have as built one line drawings been made | _____ |
| 6.4 | Are breaker coordination and arc flash parameters linked to the one line diagram | _____ |
| 6.5 | Has a review been held to mitigate arc flash effects | _____ |
| 6.6 | Have breaker settings been properly applied | _____ |
| 6.7 | Is the substation solidly grounded | _____ |
| 6.8 | Is the substation grounded through a high resistance | _____ |
| 6.9 | Is local ground fault detection in place | _____ |
| 6.10 | Is remote ground fault detection in place | _____ |
| 6.11 | If remote ground fault monitoring is not in place has a review been held to approve this | _____ |
| 6.12 | Is the substation equipment grounded-Primary Disconnect Transformer Switchgear | _____

_____ |
| 6.13 | If provided, is the substation fence grounded | _____ |
| 6.14 | Is tray, conduit, busduct, bonded to switchgear | _____ |
| 6.15 | Have all feeds been hipotted or meggered | _____ |
| 6.16 | Have all heaters, lights, etc, been inspected and tested | _____ |

Executed by: _____

Date: _____

Approved by: _____

Date: _____

Note: This document shall be maintained as a record by the C-AD Power Distribution Group